The HP Blade Workstation Solution—A new paradigm in workstation computing featuring the HP ProLiant xw460c Blade Workstation

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Executive overview

The HP Blade Workstation Solution represents a new paradigm in workstation computing. Rather than placing the workstation's computing power at the user's desk, the computing power, in the form of blade workstations, is moved to the data center where the workstations can be more easily, securely, and inexpensively managed. Centralizing an organization's workstations in the data center provides many benefits, including.

1. **Improved uptime and business continuity**—The next-generation remote management capabilities of the HP Blade Workstation Solution, along with its fault tolerant design and re-provisioning capabilities, deliver outstanding uptime. To maximize business continuity and interagency coordination, multi-site blade workstation installations can be created.
2. **Enhanced data security**—The HP Blade Workstation Solution ensures that your business-critical data remains in the data center.
3. **Reduced IT costs**—By centralizing your organization's workstations into the data center and by taking advantage of HP's robust set of remote management tools, your IT costs can be significantly reduced.

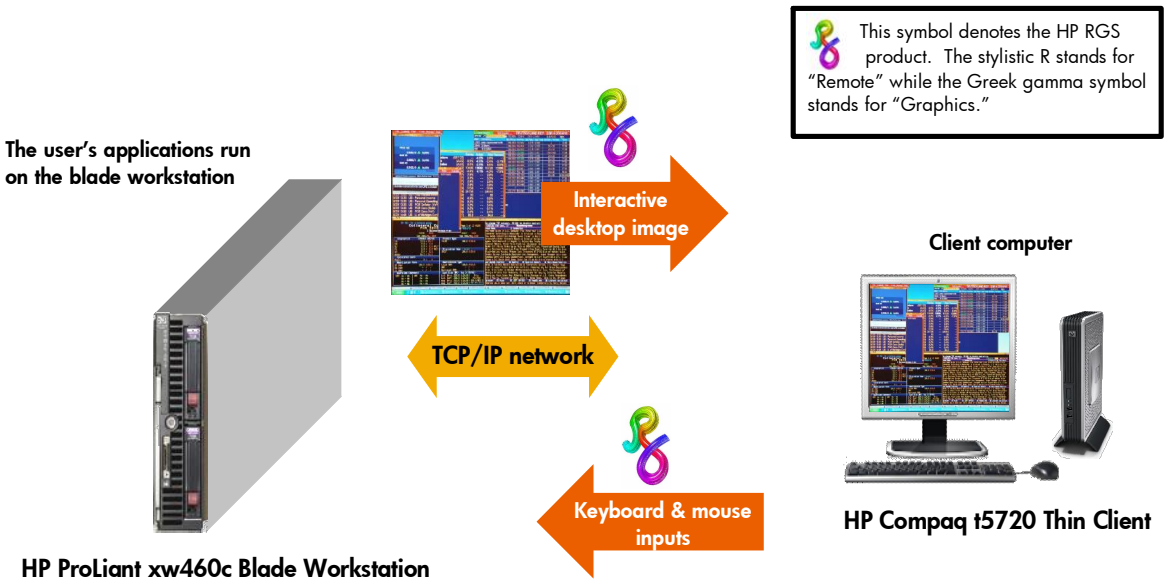
This paper describes the industry-leading HP Blade Workstation Solution and how this solution delivers the above benefits as well as many other important benefits. An overview of the solution is presented first followed by a more detailed description.

HP Blade Workstation Solution overview

The HP Blade Workstation Solution consists of three primary components, as shown in Figure 1:

- The rack-mounted HP ProLiant xw460c Blade Workstation
- The client computer
- HP Remote Graphics Software (RGS)

Figure 1. The HP Blade Workstation Solution featuring the HP ProLiant xw460c Blade Workstation


This symbol denotes the HP RGS product. The stylistic R stands for "Remote" while the Greek gamma symbol stands for "Graphics."
The user's applications run on the blade workstation
Interactive desktop image
TCP/IP network
Keyboard & mouse inputs
Client computer
HP Compaq t5720 Thin Client
HP ProLiant xw460c Blade Workstation

The blade workstation, which executes the user's applications, is designed for maximum performance and can be configured with one or two high-speed Intel® Xeon® dual-core processors.[1] The blade workstation also includes high-speed ECC memory and a dedicated graphics card that computes and renders the interactive desktop image.

Using RGS, the desktop image is transmitted over the network to the user's client computer, which displays the desktop image locally. RGS is designed to provide extremely fast capture, compression, and transmission of the desktop image over standard TCP/IP networks. RGS is also used to capture the user's keyboard and mouse inputs and send them to the blade workstation for processing by the OS and the applications running on the blade workstation. For more information on RGS, visit http://www.hp.com/go/rgs.

The client computer can range from a thin client to a multi-display desktop computer. The HP dc72 Blade Workstation Client, shown in Figure 2, supports up to four displays, providing the performance and screen real estate for demanding, data-intensive applications. To minimize cost and maintenance, the OS of the HP dc72 Blade Workstation Client is installed on a solid-state disk. To improve data security, there are no floppy or optical drives.

Figure 2. The HP dc72 Blade Workstation Client supports up to four displays.

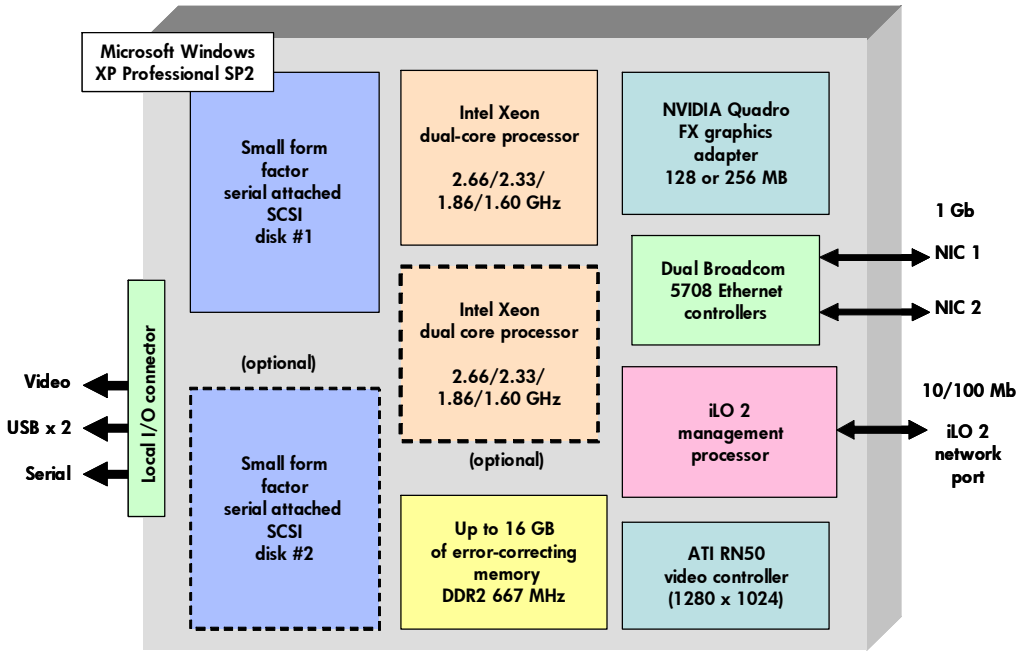
Because of the performance and features of RGS, client computers can be located anywhere, from near the data center to remote locations, while still providing a highly-interactive experience for the user. Additionally, RGS supports remote collaboration by permitting the desktop image from a single blade workstation to be sent to multiple client computers.

[1] Quad-Core and Dual-Core are new technologies designed to improve performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits; check with software provider to determine suitability; Not all customers or software applications will necessarily benefit from use of these technologies. 64-bit computing on Intel architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. See www.intel.com/info/em64t for more information.

Details of the HP Blade Workstation Solution

At the heart of the HP Blade Workstation Solution is the HP ProLiant xw460c Blade Workstation, shown in Figure 3.

Figure 3. Block diagram of the HP ProLiant xw460c Blade Workstation.

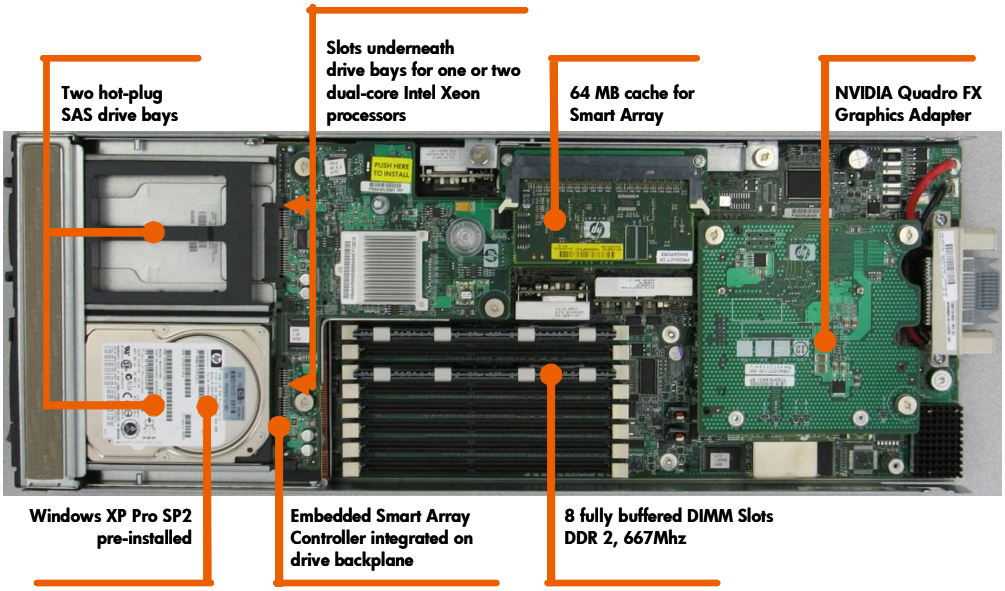

Microsoft Windows XP Professional SP2
Small form factor serial attached SCSI disk #1
Intel Xeon dual-core processor 2.66/2.33/ 1.86/1.60 GHz
NVIDIA Quadro FX graphics adapter 128 or 256 MB
1 Gb
Dual Broadcom 5708 Ethernet controllers
NIC 1
NIC 2
Intel Xeon dual core processor 2.66/2.33/ 1.86/1.60 GHz
(optional)
Video
USB x 2
Serial
Local I/O connector
(optional)
iLO 2 management processor
10/100 Mb
iLO 2 network port
Small form factor serial attached SCSI disk #2
Up to 16 GB of error-correcting memory DDR2 667 MHz
ATI RN50 video controller (1280 x 1024)

The HP ProLiant xw460c Blade Workstation is optimized for performance, including:

- One or two Intel Xeon dual-core processors running at clock rates up to 2.66 GHz.
- The NVIDIA Quadro FX high-performance graphics adapter. The most recent version is the NVIDIA Quadro FX 1600M graphics adapter.
- Up to 16 GB of ECC, Double Data Rate 2 (DDR2) memory running at 667 MHz.
- Two 1 Gb/s Ethernet ports.
- One or two high-speed Serial Attached SCSI disk drives.

Figure 4 shows the internal view of the blade workstation and its high-density packaging. For optimum space utilization, the Intel Xeon processors are installed underneath the SAS drive bays.

Figure 4. Internal view of the HP ProLiant xw460c Blade Workstation.


Two hot-plug SAS drive bays
Slots underneath drive bays for one or two dual-core Intel Xeon processors
64 MB cache for Smart Array
NVIDIA Quadro FX Graphics Adapter
Windows XP Pro SP2 pre-installed
Embedded Smart Array Controller integrated on drive backplane
8 fully buffered DIMM Slots DDR 2, 667Mhz

The small form factor of the HP ProLiant xw460c Blade Workstation makes it possible to install up to 64 blade workstations in a single 42U rack, as shown in Figure 5.

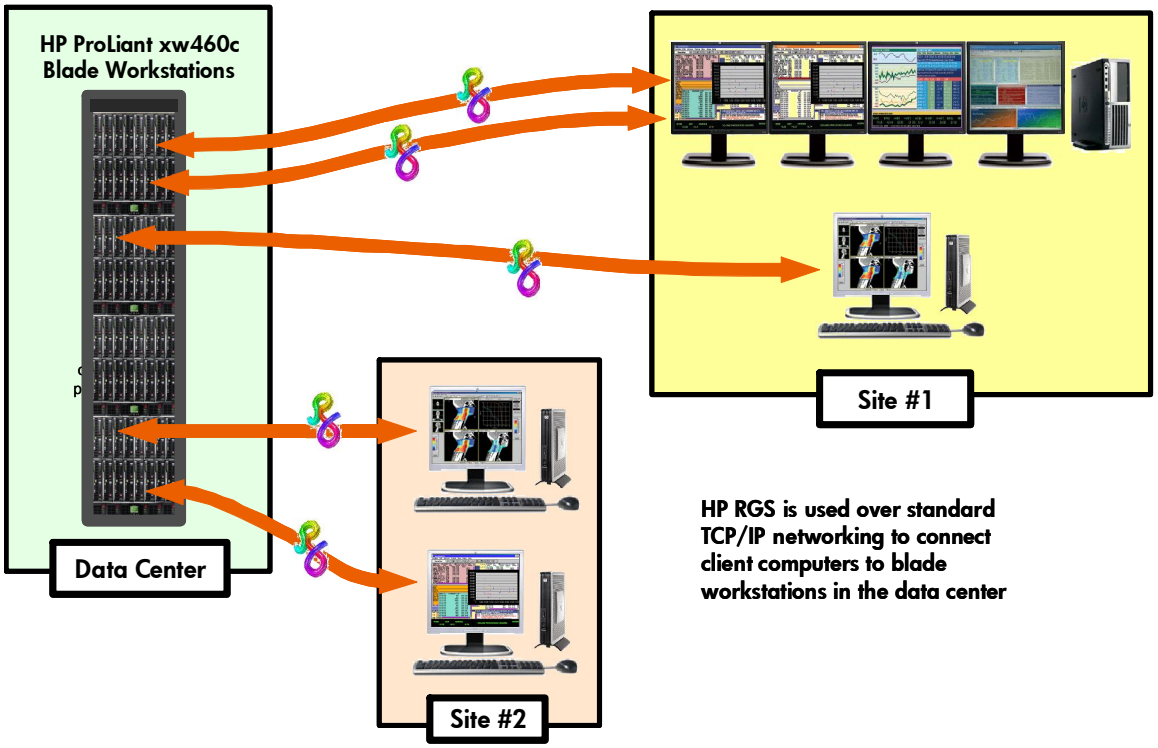
Figure 5. Up to 64 HP ProLiant xw460c Blade Workstations can be installed in a single 42U rack.

16 blade workstations per enclosure
4 enclosures per 42U rack
HP ProLiant xw460c Blade Workstation
HP BladeSystem c7000 Enclosure

The innovative HP BladeSystem c7000 Enclosure contains everything needed to support the blade workstations—hot-swappable power supplies, high-efficiency ducted cooling fans, and a next-generation blade management infrastructure.

Once the blade workstations are installed in the data center, they can be allocated to local or remote users. A single data center can support users at multiple sites, as shown in Figure 6, providing a high degree of flexibility and optimal use of blade workstation resources.

Figure 6. The blade workstations in the data center can be allocated to users at multiple sites.



HP Session Allocation Manager (SAM) can be used to optimize your HP Blade Workstation Solution deployment by automatically provisioning your blade workstation resources to users. SAM provides the following capabilities with the blade workstation solution:

- **Static and dynamic resource assignments**—SAM supports two types of resource assignments:
    - **Static resources**—With static resources, a user and the user's client computer are connected to a pre-defined set of remote computing resources, even when the user changes location.
    - **Dynamic resources**—With dynamic resources, users are assigned remote computing resources from a pool of available computing resources.

  These two types of resource assignments provide significant flexibility in meeting the needs of your users.
- **Single log in**—SAM simplifies the user experience by allowing the user to log in just once, even if the user is connecting to multiple blade workstations. Furthermore, with a multi-monitor client computer, SAM will automatically position the user's windows on the monitors connected to the client computer based on pre-configured information. The net result is that logging into the blade workstation solution is as simple as logging into a single workstation.
- **Follow-me roaming**—This feature enables users to move to a different location, and be automatically re-connected to the computing resources they used previously. In doing so, SAM automatically adapts to different monitor configurations. For example, let's assume that a user has four monitors in the office, each displaying the frame buffer from a different blade workstation. If the user relocates to home, where there is only one monitor, SAM will re-connect to the live

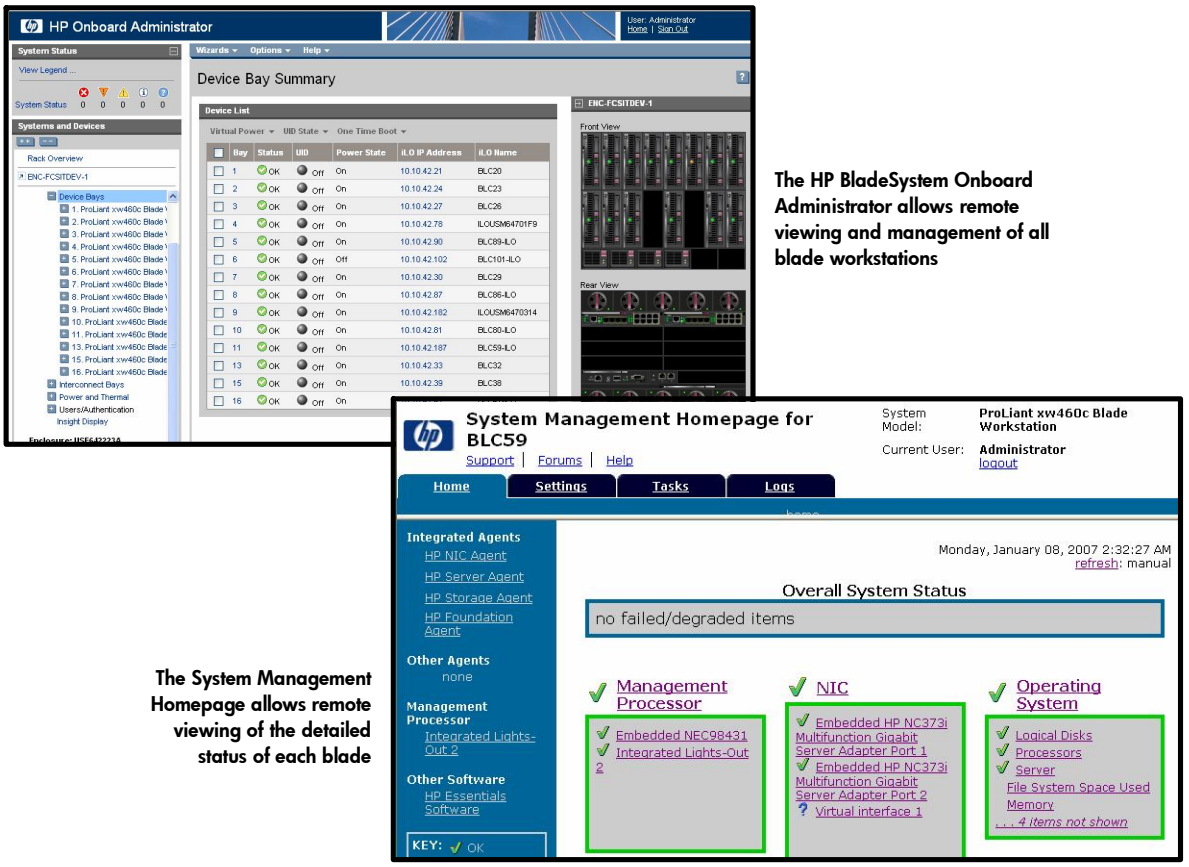
sessions on the same four blade workstations as before, but will stack the four frame buffer windows onto the single monitor for viewing. RGS can then be used to cycle between each of the four windows.

- **Automatic failover**—SAM can be configured so that if a blade workstation fails, another blade workstation will be automatically assigned to the task performed by the failed unit. This feature works for both static and dynamic connections, maximizing the uptime of the blade workstation solution and the user's productivity.
- **Automatic client aggregation**—The blade workstation solution allows multiple client computers to be aggregated together to form a single virtual client device, operated by a single keyboard and mouse. SAM can be configured to perform client aggregation automatically, while ensuring that each client computer connects to its pre-configured set of blade workstations.
- **Ease of administration**—SAM provides a web interface that allows all parameters of SAM operation to be easily monitored and changed from a central location. This is much more efficient than configuring the blade workstation solution by separately logging into each solution component.

For more information on SAM, visit www.hp.com/go/sam.

The HP Blade Workstation Solution contains extensive built-in management capabilities, most of which are accessible over the network. For example, as shown in Figure 2, the blade workstation contains the Integrated Lights-Out 2 (iLO 2) management processor, which provides an independent means of monitoring and controlling each blade. Furthermore, the blade enclosure contains the HP BladeSystem Onboard Administrator, which allows IT personnel to collectively monitor and manage the blades installed in an enclosure, such as viewing the operating status of each blade. Figure 7 shows two example management screens for the blade workstation solution.

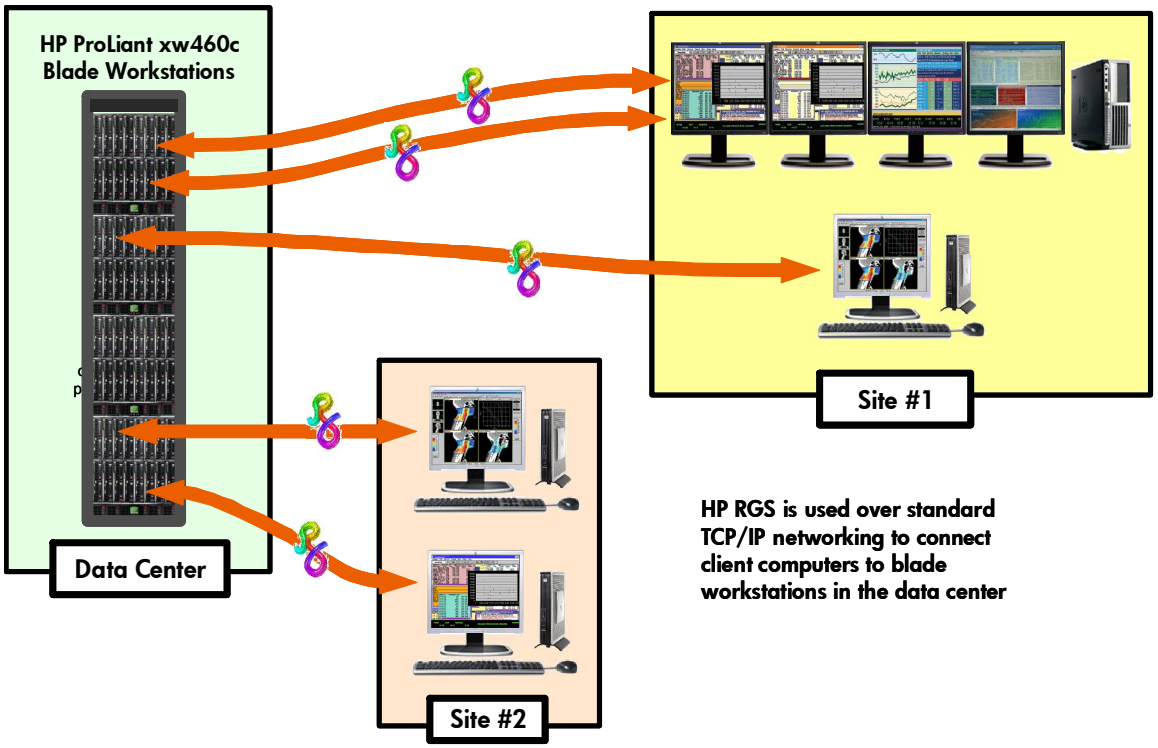
Figure 7. HP's blade workstations provide industry-leading remote management capabilities.



The blade workstation's remote management capabilities are critical to providing superior uptime and reducing IT costs by allowing support personnel to quickly detect, diagnose, and resolve problems. For example, if a user experiences a blade failure, IT personnel can quickly and remotely assign a new blade to the user from a spare pool, reducing the user's total downtime to minutes.

RGS is more than just a mechanism for sending the blade workstation's desktop image to the client access device—RGS is a full-function, real-time collaboration tool. In Figure 8, the desktop image is shared with three remote users, all of whom can interact with the same application running on the blade workstation.

Figure 8. RGS can be used in a collaborative environment to share the desktop with remote users, all of whom can view and interact with the same application running on the blade workstation.



The HP Blade Workstation Solution ensures that your application data never leaves the data center—only the desktop image is exported to the users via RGS. Furthermore, the pixels in the desktop image are encrypted for added security. The interactivity and security provided by RGS make it ideal for uses such as:

- **Financial trading**—stream video, market data, and financial trading applications from multiple workstations to a multi-display trading desk, remote office, or disaster recovery site.
- **Classified research and defense**—enable highly-secure, high-performance access to sensitive data and applications.
- **Command and control centers**—enable a highly-secure, continuous-operation environment by providing multi-location access to blade workstation resources located in redundant data centers.
- **Mobile professionals**—enable professionals to efficiently work locally or remotely so they can live where they choose and work conveniently through an Internet connection.
- **Scientific research and visualization**—interact with high-performance compute and visualization simulations from an office and collaborate with colleagues in real-time.
- **Support**—provide application support to end users by connecting to existing user sessions with system administrator rights to troubleshoot and resolve issues.
- **Classroom training**—share live training sessions with one or many students at local or remote campuses.

A real-life example: Deployment of HP Blade Workstations in the finance industry

HP blade workstations have been deployed at a number of firms in the finance industry, specifically for use on the trading floor. In a detailed follow-up study, the measured benefits included:

- Trader productivity was increased by 68%.
- IT productivity was increased by 32%.
- Disaster recovery and contingency planning were significantly simplified.
- Deployment and installation of blade workstations was simpler and more trouble-free than installing individual workstations.
- The trading floor work environment was markedly improved—less noise, heat, and clutter.
- Traders were more easily able to work remotely.

For a copy of this study, *Blade Workstations in the Securities Industry—An ROI Study*, see http://h71028.www7.hp.com/ERC/downloads/c00834884.pdf.

Summary of the benefits of the HP Blade Workstation Solution

Summarized below are the benefits of the HP Blade Workstation Solution, and how these benefits are provided.

1. **Benefit**: Improved uptime and business continuity.

   How provided: The HP Blade Workstation Solution maximizes uptime by providing a number of fault-tolerant features such as redundant network switches, RAID, error correcting memory, and hot-swappable power supplies. Furthermore, HP's advanced management features enable quick detection and correction of hardware problems. In the event of a blade workstation failure, another blade workstation can be rapidly provisioned to the end user. Business continuity can be maximized by employing a distributed data center strategy and routing activity to a fallback data center if the primary data center experiences problems.

2. **Benefit**: Enhanced data security for your company-critical data.

   How provided: With the HP Blade Workstation Solution, your sensitive data is locked in the data center—only the encrypted desktop image is exported to the users via RGS. In addition, HP's blade workstation client contains no removable storage media, further protecting your data.

3. **Benefit**: Reduced IT costs.

   How provided: HP's innovative blade workstation solution reduces IT costs in a number of ways, including:

   - By centralizing your workstation resources, support personnel will be able to more easily manage and support your workstations.
   - HP's leading-edge blade workstation management tools enable support personnel to quickly detect, diagnose, and resolve problems.
   - If a blade workstation goes down, IT can quickly provision another blade workstation to the user without needing to physically visit the user.

4. **Benefit**: Reduced noise, heat, and clutter.

   How provided: Moving your workstations into the data center will eliminate the noise, heat, and clutter associated with having workstations distributed about in an office environment, providing your users with a much friendlier work environment.

5. **Benefit**: Simplified load balancing of the workstation demands within your organization.

   How provided: The flexibility to quickly re-assign workstation resources is often necessary, ranging from a situation where a single user's workstation goes down to a situation where many workstations need to be re-allocated to handle computationally-intensive task such as a computer simulation. With the HP Blade Workstation Solution, reassigning workstation resources can be done remotely and without needing to physically move any equipment or wires. Incorporation of SAM (Session Allocation Manager) provides additional capabilities to load-balance your workstations and respond quickly to new requirements.

6. **Benefit**: Support for users working locally or remotely.

   How provided: Because of the performance provided by RGS, users are able to work locally or remotely with comparable efficiency.

7. **Benefit**: The ability for teams to securely collaborate from remote locations while allowing the owner of the data to retain complete control of it.

   How provided: With RGS, the desktop image from the blade workstation can be sent to multiple users, allowing them to view and interact with the same applications. In doing this, the application data remains securely on the blade workstation.

Conclusion

The HP Blade Workstation Solution is an industry-leading workstation infrastructure that delivers many important benefits compared to distributed workstations, including improved uptime/business continuity, enhanced data security, and reduced IT costs. The solution also provides improved user comfort, better resource utilization, ease of working remotely, and real-time, remote collaboration between individuals and teams. The HP Blade Workstation Solution, 5+ years in the making, is the only solution of its kind and has successfully proven itself in very demanding environments, including on the financial trading floor.

For more information

For more information on the HP Blade Workstation Solution, visit the blade workstation solution home page at www.hp.com/go/bladeworkstation. A number of papers on the blade workstation solution are located under the **Learn more** tab.

For in-depth information on the blade workstation solution, visit www.hp.com/support/xw460c_manuals.

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